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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Paul S. GLOYER et al.

Appl. No. : 09/802,760

Filed : March 8, 2001

Examiner Rachel F. Gorr
Technology Center 1700
Group Art Unit 1711
Confirmation No. 8217

For : POLYURETHANE ELASTOMERS AND SHAPED ARTICLES PREPARED THEREFROM

APPEAL BRIEF UNDER 37 C.F.R. § 1.192(a)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is from the Examiner's final rejection of claims 1, 3-10, 25-33, and 47, as set forth in her April 18, 2003 Office Action.

A. REAL PARTY IN INTEREST

The real parties in interest for the invention are Heidelberg Digital L.L.C., a Delaware limited liability company, NexPress Solutions LLC, a New York limited liability company, and Eastman Kodak Company, a New Jersey corporation.

B. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative, and the Assignees are not aware of any other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

C. STATUS OF CLAIMS

Claims 1-48 have been presented in this application. Of these, claim 2 has been cancelled, thereby leaving claims 1 and 3-48 as the pending claims.

As to the claims that are pending, claims 11-24, 34-46, and 48 are nonelected and withdrawn from consideration. Of these, claims 15, 38, and 48 are independent.

Accordingly, the claims that are pending and elected are claims 1, 3-10, 25-33, and 47. Of these, claims 1, 25, and 47 are independent.

All of pending and elected claims 1, 3-10, 25-33, and 47 stand finally rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,286,570 (SCHLUETER, JR. et al.) in view of U.S. Patent No. 4,729,925 (CHEN et al.) and European Patent Application No. 0 604 334 (RAMOS et al.). These pending and elected claims also are all on appeal, and are all reproduced in an Appendix attached to the end of this Appeal Brief.

D. STATUS OF AMENDMENTS

No amendment has been filed subsequent to the final rejection.

E. SUMMARY OF THE INVENTION

The invention pertains to a polyurethane elastomer comprising the reaction product of a polyisocyanate prepolymer, a polyether polyol prepolymer, and a hardener mixture. The polyisocyanate prepolymer is formed by reacting an isocyanate with a polyol, and the hardener mixture includes at least one additional polyol and also at least one charge-control agent. (Specification: page 4, lines 20-24, line 28, line 31, and line 32; page 5, lines 9-13, line 17, line 20, and line 21; page 9, lines 13-16, lines 18-20, and line 22)

The polyisocyanate prepolymer is present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition (Specification: page 4, lines 24-26; page 5, lines 13-15; page 9, lines 16 and 17). The polyether polyol prepolymer is present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition (Specification: page 4, lines 28 and 29; page 5, lines 17 and 18; page 9, lines 18 and 19). The hardener mixture is present in an amount of from 1 to 25 weight percent of the total elastomer composition (Specification: page 4, lines 32 and 33; page 5, lines 24 and 25; page 9, lines 22-24).

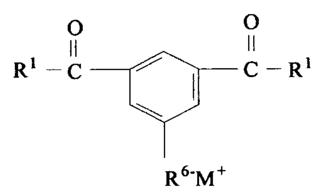
The at least one charge-control agent can be capable of being copolymerized with the polyisocyanate prepolymer, the

polyether polyol prepolymer, and the hardener mixture (Specification: page 5, lines 20-23; page 12, line 35 through page 13, line 6), and the at least one charge-control agent can be a polyol (Specification: page 11, lines 21-35). Particularly, the charge-control agent can be a polyol comprising an ionic functional group (Specification: page 8, line 32 through page 9, line 11).

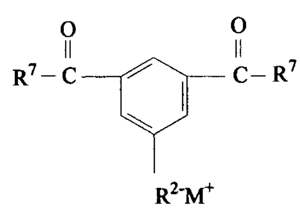
Further, the at least one charge-control agent can be both a polyol and also capable of being copolymerized with the polyisocyanate prepolymer, the polyether polyol prepolymer, and the hardener mixture (Specification: page 5, lines 33-35).

Yet additionally, the charge-control agent can be a polyol charge-control agent selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$\left[O\left(CH_2\right)_5\overset{\overset{\displaystyle O}{\|}}{C}\right]_m OCH_2CH_2OCH_2CH_2O\left[\overset{\overset{\displaystyle O}{\|}}{C}\left(CH_2\right)_5 O\right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$\left(O-R^3-\overset{\overset{\displaystyle O}{\|}}{C}\right)_p OR^4-O\left(\overset{\overset{\displaystyle O}{\|}}{C}-R^3-O\right)_q H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$\left(R^5-O\right)_x R^5$$

R^5 is the same as R^3;

x is 1 to 10, or 2 to 7;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$. (Specification: page 5, line 33 through page 7, line 28; page 13, line 9 through page 14, line 31)

A particular polyol that is suitable as a charge-control agent is poly(oxy(1-oxo-1,6-hexanediyl)), alpha, alpha' oxydi-2,1-ethanediyl)bis(w-hydroxy-5-sulfo-1,3-benzenedicarboxylate (2:1), ion(1-)methyltriphenylphosphonium (Specification: page 16, lines 15-18).

Preferably, charge control agent is present in an amount of less than 2 weight percent, or less than 1 weight percent, or from 0.1 to 0.9 weight percent, or from 0.4 to 0.7 weight percent, based on the total weight of the elastomer (Specification: page 5, lines 29-31; page 10, lines 5-10; page 17, lines 8-16).

The amounts of the polyisocyanate prepolymer, the polyether polyol, and hardener mixture are selected such that the equivalent ratio of hydroxyl functionality to isocyanate

functionality is from 0.96 to 1.04, or from 1.00 to 1.04 (Specification: page 5, lines 27-29; page 18, lines 10-17).

The invention further pertains to a shaped article comprising the polyurethane elastomer as indicated. And the polyurethane elastomer of the invention can have a resistivity of less than 6 X 10^9 ohm-cm. (Specification: page 8, lines 14-19; page 20, lines 5-12)

F. ISSUE

Whether claims 1, 3-10, 25-33, and 47 are unpatentable under 35 U.S.C. § 103(a) over U.S. Patent No. 5,286,570 (SCHLUETER, JR. et al.) in view of U.S. Patent No. 4,729,925 (CHEN et al.) and European Patent Application No. 0 604 334 (RAMOS et al.)

G. GROUPING OF CLAIMS

Claims 1, 3-10, 25-33, and 47 are considered to stand or fall together, but only for the purpose of the rejection on appeal.

H. ARGUMENT

The Examiner concludes that it would have been obvious, in the SCHLUETER, JR. et al. polyurethane elastomer, to replace the SCHLUETER, JR. et al. charge-control agents with the CHEN et al. and RAMOS et al. charge-control agents, to prevent agent from leaching out (April 18, 2003 final Office Action, paragraph 7). The Examiner's sole justification for this conclusion is her unsupported statement that CHEN et al. and RAMOS et al. teach a "better" way for incorporating charge-control agents (April 18, 2003 final Office Action, paragraph 8). Not only does the Examiner fail to present any evidence substantiating the alleged superiority, but this is not the correct standard for combining teachings. Rather, the proper criterion is motivation; and the Examiner fails to show the

necessary motivation for combining the teachings of CHEN et al. and RAMOS et al. with those of SCHLUETER, JR. et al.

The Examiner inaccurately truncates Appellants' arguments, in stating Appellants' position to be that "one wouldn't use the charge control agents of CHEN and RAMOS in SCHLUETER's polyurethane because the charge control agents of SCHLUETER are different" (April 18, 2003 final Office Action, paragraph 8). In fact, Appellants maintain, correctly, that SCHLUETER, JR. et al. on the one hand, and CHEN et al. and RAMOS et al. on the other, address the problem of charge-control agent depletion by means of different and unrelated mechanisms, and using different and unrelated agents.

As to different and unrelated mechanisms, SCHLUETER, JR. et al. teaches a mobile charge-control agent, with agent movement through the polyurethane elastomer being reduced by the configurations both of the agent itself and of the elastomer; in contrast, CHEN et al. and RAMOS et al. teach agent retention by actual attachment to the elastomer. As to different and unrelated agents, the SCHLUETER, JR. et al. charge-control agents are asymmetric aliphatic sulfates, in contrast to the aromatic polyols of CHEN et al. and RAMOS et al.

So not only does the Examiner fail to meet her burden of showing the requisite motivation, but in fact the above-noted different and unrelated mechanisms and agents establish that motivation must of necessity be lacking. By itself, this absence of motivation requires the conclusion that SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. do not establish *prima facie* obviousness.

Moreover, the Examiner's proposed modification would change the SCHLUETER, JR. et al. principle of operation. For this additional reason, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. do not establish *prima facie* obviousness.

Yet further, SCHLUETER, JR. et al. even teaches away from the particular modification argued by the Examiner - i.e., substituting in the copolymerizable charge-control agents of CHEN et al. and RAMOS et al. The SCHLUETER, JR. et al. requires its polyurethane elastomer to include triol crosslinker, for the purpose of providing the polymer crosslinking network that reduces charge-control agent mobility. This requirement is inconsistent with using the CHEN et al. and RAMOS et al. agents, which instead are retained by attachment. So for this still additional reason, the claims on appeal are patentable over the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

And still additionally, SCHLUETER, JR. et al. and CHEN et al. and RAMOS et al., as cited by the Examiner, fail to teach or suggest Appellants' 45 to 70 weight percent of polyisocyanate prepolymer, as recited in all of the claims on appeal. The Examiner mistakenly cites Example II of SCHLUETER, JR. et al. as disclosing 50 weight percent polyisocyanate prepolymer (April 18, 2003 final Office Action, paragraph 4). However, the proportion, of the SCHLUETER, JR. et al. Example II polyisocyanate prepolymer, actually cannot be more than 18.78 weight percent. And the significance, of the difference between this 18.78 weight percent of SCHLUETER, JR. et al. Example II polyisocyanate prepolymer, and Appellants' recited 45 weight percent lower limit of polyisocyanate prepolymer, is demonstrated in the art. Accordingly, for this still additional reason, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. do not establish *prima facie* obviousness.

1. **There is no motivation for combining the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.**

All three of the references presently cited by the Examiner against the claims - SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. - indeed do disclose polyurethane elastomers provided with charge-control agents, for the purpose of stabilizing elastomeric

resistivity (SCHLUETER, JR. et al., column 1, lines 47-50; CHEN et al., column 1, lines 45-59; RAMOS et al., page 3, lines 19 and 20).

Moreover, each of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. address the problem of charge-control agent being lost from the elastomer (SCHLUETER, JR. et al., column 1, line 64 through column 2, line 11; CHEN et al., column 1, lines 45-59; RAMOS et al., page 1, line 19 through page 2, line 3).

Yet additionally, SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. all teach means of inhibiting charge-control agent depletion.

However, SCHLUETER, JR. et al. on the one hand, and CHEN et al., and RAMOS et al. on the other, deal with this problem by means of different, and in fact unrelated, mechanisms. Further, they do so using different and unrelated agents.

As to the different and unrelated mechanisms, SCHLUETER, JR. et al. employs a very asymmetric charge-control agent that remains unattached in the polyurethane elastomer, with this elastomer itself being highly crosslinked. Mobility and diffusion of the charge-control agent, through the polymeric network, is reduced by both the asymmetry of the agent and the high degree of polymeric crosslinking (column 2, line 65 through column 3, line 1; column 4, lines 36-40).

In contrast, CHEN et al. and RAMOS et al. actually attach the charge control agent to the elastomer - specifically, by copolymerizing the charge control agent with the other reactants in the making of the polyurethane (CHEN et al., column 2, lines 25-32; RAMOS et al., page 3, lines 31 and 32, and page 4, line 1). Contrary to SCHLUETER, JR. et al., CHEN et al. and RAMOS et al. do not teach or suggest the use of elastomer crosslinking and charge control agent asymmetry for inhibiting agent depletion.

As to the different and unrelated charge-control agents, the SCHLUETER, JR. et al. charge-control agents are asymmetric, ionic aliphatic quaternary ammonium sulfate salts, characterized by the formula as set forth in SCHLUETER, JR. et al. at column 2, lines 55-65 and column 7, lines 25-40. In contrast, the charge-control agents of CHEN et al. and RAMOS et al. are aromatic polyols of particular formulae (CHEN et al., column 1, line 65 through column 3; RAMOS et al., page 3, lines 31-58; page 4, lines 29 and 30). The dissimilarity and unrelatedness of the agents is readily apparent from comparison of the indicated formulae.

Accordingly, SCHLUETER, JR. et al. indeed does employ completely different and unrelated means, from those of CHEN et al. and RAMOS et al., to effect charge control agent retention, and completely different and unrelated charge control agents for

accomplishing this result. Therefore, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. provide no motivation for using the charge control agents of CHEN et al. and RAMOS et al. in the SCHLUETER, JR. et al. polyurethane elastomer.

And regarding RAMOS in particular, as compared with SCHLUETER, JR. et al. and CHEN et al., the RAMOS et al. patent publication discloses a polyurethane elastomer copolymerized with charge control agent, having a shore A hardness of from about 15 to about 40, and employed with particle transfer rollers used to clean moving webs (page 3, lines 1-2; page 4, lines 4-8 and lines 29-30). RAMOS et al. teaches that the CHEN et al. transfer roller is unacceptable for use as a particle transfer roller, because it has too high a durometer - in the range of 40-90 Shore A (page 3, lines 19-25).

And CHEN et al. indeed does teach a hardness of about 40-90 Shore A (column 9, lines 36-39), while SCHLUETER, JR. et al. correspondingly discloses a Shore A harness range of from 60 to about 95 (column 4, lines 55-61; column 5, lines 15-20). But in any event, nothing in RAMOS et al. supplies the deficiencies of the references, as have been noted in detail.

With respect to these deficiencies, the Examiner's only basis, for finding the combination of SCHLUETER, JR. et al., CHEN

et al., and RAMOS et al. to have been obvious, is her conclusion that CHEN et al. and RAMOS et al. teach a "better" way for incorporating charge-control agents (April 18, 2003 final Office Action, paragraph 8). The Examiner presents no evidence for this position, and in fact her conclusion requires assumptions that are without support in the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

For instance, nothing in SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. supports any argument that the attachment means of CHEN et al. and RAMOS et al. are superior to obstructing movement of a mobile agent by asymmetry and crosslinking, as taught by SCHLUETER, JR. et al. Nor are there grounds for concluding that the attached polyols of CHEN et al. and RAMOS et al. give "better" results than the SCHLUETER, JR. et al. obstructed ammonium salts.

And notwithstanding the foregoing, the Examiner does not apply the proper standard for determining obviousness. The correct issue to be addressed is whether there is motivation for combining the SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. teachings. The Examiner does not cite any, and in fact there is none. This absence of motivation by itself supports the conclusion that the claims are allowable over the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

2. The Examiner's proposed modification would change the SCHLUETER, JR. et al. principle of operation

It is further noted that as a matter of law, if the proposed modification would change the principle of operation that is taught in the reference being modified, then the teachings of the references are not sufficient to have rendered the claimed invention *prima facie* obvious. In re Ratti, 123 U.S.P.Q. 349 (CCPA 1959); M.P.E.P. §2143.01. And in fact, combating charge-control agent depletion by attachment of the agent, as taught in CHEN et al. and RAMOS et al., indeed would change the SCHLUETER, JR. et al. means of retaining agent by asymmetry and crosslinking.

Therefore, teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. are not sufficient to have rendered the claimed invention *prima facie* obvious. So for this additional reason, the claims are allowable over the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

3. SCHLUETER, JR. et al. teaches away from CHEN et al. and RAMOS et al.

And not only would combining the teachings of SCHLUETER, JR. et al., and RAMOS et al. not have been obvious, but SCHLUETER, JR. et al. actually teaches away from the very modification to SCHLUETER, JR. et al. that is argued by the Examiner - i.e., replacing the SCHLUETER, JR. et al. charge control agent with

those of CHEN et al., and RAMOS et al. In this regard, it is yet further noted, also as a matter of law, that combining references which teach away from their combination is improper. In re Grasselli, 218 U.S.P.Q. 769 (Fed. Cir. 1983); M.P.E.P. §2145, paragraph X.D.2.

As to this principle, SCHLUETER, JR. et al. requires, for the elastomer taught therein, a sufficient amount of bifunctional chain extenders and trifunctional crosslinking agents to provide a crosslinked elastomer, and the trifunctional crosslinking agents must comprise 10% to 40% by weight of the extenders and crosslinkers (column 3, lines 10-20; column 3, lines 35-42; column 6, lines 33-38). The trifunctional agents are needed for contributing the crosslink exchange sites that provide the three-dimensional network (column 7, lines 5-10); it is this network that acts, in conjunction with the agent asymmetry, to combat depletion.

Requiring this network, to inhibit the passage of mobile charge-control agent, is inconsistent with using charge-control agents that are instead retained by attachment, as taught by CHEN et al. and RAMOS et al. SCHLUETER, JR. et al. therefore indeed does teach away from the Examiner's proposed combination with CHEN et al. and RAMOS et al.; so for this still

further reason, the claims are allowable over the combination of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

4. <u>SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. fail to teach or suggest all of Appellants' recited limitations</u>

On of the requirements for establishing a *prima* facie case of obviousness is that the art must teach or suggest all the claim limitations. Each of Appellants' claims on appeal recites 45 to 70 weight percent polyisocyanate prepolymer. The Examiner addresses this recitation by citing Example II of SCHLUETER, JR. et al. as teaching "50 wt % prepolymer" (April 18, 2003 final Office Action, paragraph 4). However, even if Example II of SCHLUETER, JR. et al. is read most favorably for the purposes of the Examiner, it cannot be teaching more than 18.78 weight percent of polyisocyanate prepolymer.

It is presumed that the Examiner's error is caused by the assumption that all of Mix A, in Example II of SCHLUETER, JR. et al., polymerizes to form polyisocyanate prepolymer. In fact, the starting materials of this Mix A – these materials being combined to form Mix A before Mix A is added to other materials – consist of polytetramethylene ether glycol (PTMEG) and 4,4'-diphenyl methane diisocyanante (MDI) (SCHLUETER, JR. et al., column 10, line 65 through column 11, line 9); further, PTMEG

and MDI indeed are polymerizable to polyisocyanate prepolymer, by means of the reaction of PTMEG hydroxyl functionality with MDI isocyanate functionality to provide the urethane group.

The Mix B starting materials in Example II of SCHLUETER, JR. et al. - these materials correspondingly being combined to form Mix B before Mix B is added to other materials - consist of butanediol (BDO), the Cyastat LS charge-control agent, and more PTMEG (SCHLUETER, JR. et al., column 11, lines 10-16).

The polyurethane polymer of SCHLUETER, JR. et al. Example II is prepared from a composition that includes, *inter alia*, 30.6 parts of Mix A and 30 parts of Mix B (SCHLUETER, JR. et al., column 11, lines 19-29). Of this composition, it is the Mix A and Mix B materials that polymerize to form the polyurethane; the other materials in this composition are solvent and surfactant.

The 30.6 parts of Mix A and 30 parts of Mix B add up to 60.6 parts. 30.6 parts of Mix A is about 50 weight percent of this 60.6 parts total. It is presumed that the Examiner made this calculation, and based her conclusion of "50 wt % prepolymer" on the assumption that before its addition to the composition including Mix B, all of Mix A had polymerized to provide polyisocyanate prepolymer.

However, because of the large excess of isocyanate to hydroxyl in Mix A, it is impossible for all of Mix A to have undergone this prepolymerization. Even assuming a result most favorable to the Examiner's position, the prepolymerization must of necessity have left unreacted MDI; the most polyisocyanate prepolymer that Mix A could have provided, for reaction with Mix B, would have been an amount of polyisocyanate prepolymer sufficient to provide 18.78 weight percent prepolymer.

In this regard, the PTMEG of SCHLUETER, JR. et al. Example II is Terathane 650 (SCHLUETER, JR. et al., column 10, line 68 through column 11, line 1), which is characterized by a molecular weight of 650 and 2 hydroxyl equivalents per mole. MDI has a molecular weight of 251 and 2 isocyanate equivalents per mole.

Mix A consists of 92.3 parts MDI added to 16.5 parts PTMEG (SCHLUETER, JR. et al., column 11, lines 5-7), totaling 108.8 parts. The PTMEG and MDI therefore provide 0.01428 hydroxyl equivalents and 0.20685 isocyananate equivalents, respectively.

Accordingly, the PTMEG is the limiting reactant. The prepolymerzation most favorable to the Examiner's position would provide reaction of the maximum amount of MDI, so as to incorporate as high a proportion as possible of the reactants into prepolymer. This would involve the formation of triblocks

exclusively - nothing but oligomers, each characterized by a PTMEG endcapped by two MDI monomers, with neither of these two reacted MDI monomers reacted with any other PTMEG.

Of course, such an idealized result for the Examiner - i.e., a product of pure MDI-PTMEG-MDI triblock prepolymer - would not be expected to occur. But even if it did, the resulting proportion of polyisocyanate prepolymer indeed could only reach 18.78 weight percent, as demonstrated by the following calculations.

Equivalents of Polyisocyanate Prepolymer Reactants Consumed (Max.)

Equivalents PTMEG Polymerized (Max.)_______________0.01428

Equivalents MDI Polymerized (Max.)___2 x 0.01428 = 0.02856

Wt. of Polyisocyanate Prepolymer Formed (Max.)

Wt. PTMEG Reacted (Max.)__0.01428 OH equiv./2 equiv. per mole x 650 g. per mole = 4.64 g

Wt. MDI Reacted (Max.)____0.02856 CNO equiv./2 equiv. per mole x 251 g. per mole = 35.84 g

Total Wt. Reactants Consumed_______4.64 g + 35.84 g = 40.48 g

Wt. % of Polyisocyanate Prepolymer in Mix A (Max.)

Max. Wt. Polyisocyanate Prepolymer/Total Wt. Mix A x 100%
= 40.48 g/108.8 g x 100%
= 37.2 wt.%

Wt. % of Isocyanate Prepolymer in Polyurethane Product (Max.)

30.6 parts Mix A x 37.2 wt.% Polyisocyanate Prepolymer/60.6 parts Polyurethane Product

= 18.78 wt.%

Even this 18.78 weight percent idealized result, for the SCHLUETER, JR. et al. Example II polyisocyanate prepolymer, is significantly less than the 45 weight percent lower limit of Appellants' recited range. And to the extent that, in actual practice, the polyisocyanate prepolymer of SCHLUETER, JR. et al. Example II were to deviate from this 18.78 weight percent hypothetical yield of pure triblock prepolymer - which of course it must do - then the weight percent of polyisocyanate prepolymer obtained would be that much less, and so differ from Appellants' 45 weight percent lower limit to an even greater extent.

And in fact, the Examiner would not be permitted to rely on the foregoing 18.78 weight percent idealized maximum for the SCHLUETER, JR. et al. Example II polyisocyanate prepolymer. Where the Examiner cites a reference as providing a teaching, the burden is on her to demonstrate that this teaching actually is to be found in the reference. The Examiner has failed to

show that SCHLUETER, JR. et al. Example II teaches 18.78 weight percent, or any other quantifiable amount, of polyisocyanate prepolymer. So the Examiner would not be entitled to assert any numerical value, for the polyisocyanate prepolymer of SCHLUETER, JR. et al. Example II, in trying to argue that SCHLUETER, JR. et al. teaches or suggests Appellants' recited polyisocyanate prepolymer 45 to 70 weight percent range.

Yet further, the significance of the difference - between even the idealized 18.78 maximum weight percent polyisocyanate prepolymer of SCHLUETER, JR. et al. Example II, and Appellants' recited 45 weight percent lower limit for polyisocyanate prepolymer - is conclusively demonstrated by the art. For instance, the superiority of Appellants' higher proportion of polyisocyanate prepolymer is addressed by the SCHLUETER, JR. et al. reference itself.

In this regard, at column 8, lines 15-35, SCHLUETER, JR. et al. states that the polyurethane elastomer final product may be made without first preparing a prepolymer, by reacting all the starting materials - including those that would otherwise have been used for forming the prepolymer - together at once. However, SCHLUETER, JR. et al. further states here that proceeding in this manner results in a more random polyurethane product, because multiple types of reactions are occurring

simultaneously; instead, initially preparing the prepolymer allows for greater control of the reaction, and correspondingly a more predictable result.

Accordingly, the higher the proportion of the polymer final product that is provided by polyisocyanate prepolymer, the more control can asserted in the polymerization process, to obtain the desired polyurethane product. So Appellants' recited 45 to 70 weight percent of polyisocyanate prepolymer, comprising a greater proportion of the polyurethane than is taught in Example II of SCHLUETER, JR. et al., correspondingly allows for greater control of polymerization, and also a more predictable polyurethane structure, than would be produced by SCHLUETER, JR. et al. Example II.

Example II of SCHLUETER, JR. et al. therefore does not teach or suggest Appellants' recited 45 to 70 weight percent of polyisocyanate prepolymer. Accordingly, with respect to each of Appellants' claims on appeal, SCHLUETER, JR. et al., CHEN at al., and RAMOS et all, as applied by the Examiner, fail to disclose or suggest all the recited limitations.

Therefore, also for this reason, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. are not sufficient to have rendered the claimed invention *prima facie* obvious. So for this additional reason, the claims are allowable over the

combination of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

I. CONCLUSION

For the reasons advanced above, Appellants submit that the rejection should be reversed.

This Appeal Brief is being submitted in triplicate, pursuant to 37 C.F.R. §1.192(a).

Also being submitted is a transmittal, authorizing payment in the amount of $440.00. Of this $440.00 total, $330.00 is the fee set forth in 37 CFR §1.17(b), for filing a brief in support of an appeal, and $110.00 is the fee set forth in 37 CFR §1.17(a)(1), for a one month extension of time for filing the brief. No additional fees are believed to be due at this time. However, the Commissioner is authorized to charge any additional fee, or to credit any overpayment, to Deposit Account No. 50-1381.

Respectfully submitted,
Paul S. GLOYER et al.

Roger P. Glass

Roger P. Glass
Reg. No. 30,841

October 17, 2003
Roger P. Glass, Esq.
5597 Seminary Road, No. 1301S.
Falls Church, VA 22041
(703) 379-8443

APPENDIX

CLAIMS ON APPEAL:

1. A polyurethane elastomer comprising the reaction product of:

a polyisocyanate prepolymer formed by reacting an isocyanate with a polyol, said polyisocyanate prepolymer being present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition;

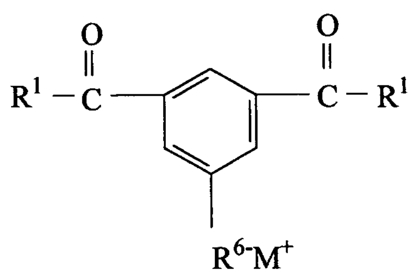
a polyether polyol prepolymer present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition; and

a hardener mixture comprising at least one additional polyol and at least one charge-control agent, the at least one charge control agent being a polyol capable of being copolymerized with the polyisocyanate prepolymer, the polyether polyol, and the hardener mixture, the hardener mixture being present in an amount of from 1 to 25 weight percent of the total elastomer composition,

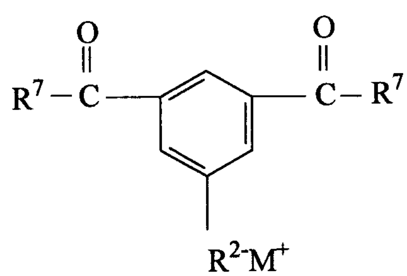
the amounts of the polyisocyanate prepolymer, the polyether polyol, and hardener mixture being selected such that the equivalent ratio of hydroxyl functionality to isocyanate functionality is from 0.96 to 1.04.

3. The elastomer of Claim 1 wherein the charge-control agent is a polyol charge-control agent selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$\left[O\left(CH_2\right)_5 \overset{\displaystyle O}{\overset{\|}{C}}\right]_m OCH_2CH_2OCH_2CH_2O\left[\overset{\displaystyle O}{\overset{\|}{C}}\left(CH_2\right)_5 O\right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$-\!\left(O-R^3-\overset{\displaystyle O}{\overset{\|}{C}}\right)_{p}\!-OR^4-O\left(\overset{\displaystyle O}{\overset{\|}{C}}-R^3-O\right)_{q}\!-H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$-\!\left(R^5-O\right)_{x}R^5$$

R^5 is the same as R^3;

x is 1 to 10;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$.

4. (Amended) The elastomer of Claim 1 wherein the charge-control agent is poly(oxy(1-oxo-1,6-hexanediyl)), alpha, alpha' oxydi-2,1-ethanediyl) bis(w-hydroxy-5-sulfo-1,3-benzenedicarboxylate(2:1),ion(1-)methyltriphenylphosphonium.

5. The elastomer of Claim 3 wherein x is from 2 to 7.

6. The elastomer of Claim 3 wherein the charge-control agent is present in an amount of less than 2 weight percent based on total weight of the elastomer.

7. The elastomer of Claim 3 wherein the charge-control agent is present in an amount of less than 1 weight percent based on total weight of the elastomer.

8. The elastomer of Claim 3 wherein the charge-control agent is present in an amount of from 0.4 to 0.7 weight percent based on total weight of the elastomer.

9. The elastomer of Claim 1 having a resistivity of less than $6X10^9$ ohm-cm.

10. A shaped article comprising the elastomer of Claim 1.

25. A polyurethane elastomer comprising the reaction product of:

a polyisocyanate prepolymer formed by reacting an isocyanate with a polyol, said polyisocyanate prepolymer

being present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition;

a polyether polyol prepolymer present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition; and

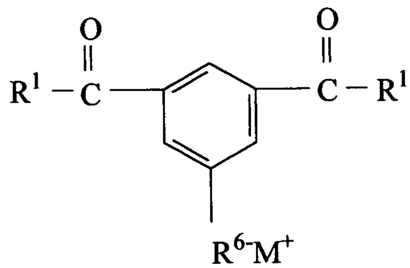
a hardener mixture comprising at least one additional polyol and at least one charge-control agent capable of being copolymerized with the polyisocyanate prepolymer, the polyether polyol prepolymer, and the hardener mixture such that the charge-control agent is covalently bonded to the polyurethane elastomer, the hardener mixture being present in an amount of from 1 to 25 weight percent of the total elastomer composition,

the amounts of the polyisocyanate prepolymer, the polyether polyol prepolymer, and hardener mixture being selected such that the equivalent ratio of hydroxyl functionality to isocyanate functionality is from 0.96 to 1.04, and the charge-control agent is present in an amount of less than 2 weight percent based on total weight of the elastomer.

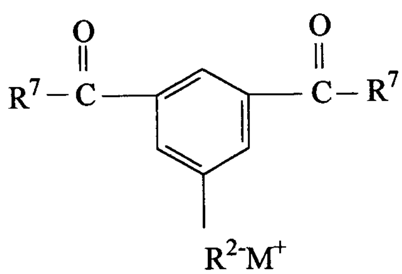
26. The elastomer of Claim 25 wherein the charge-control agent is a polyol comprising an ionic functional group.

27. The elastomer of Claim 25 wherein the charge-control agent is a polyol charge-control agent selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$\left[O \left(CH_2 \right)_5 \overset{\displaystyle O}{\overset{\|}{C}} \right]_m OCH_2CH_2OCH_2CH_2O \left[\overset{\displaystyle O}{\overset{\|}{C}} \left(CH_2 \right)_5 O \right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$-\!\!\left(O-R^3-\overset{\displaystyle O}{\overset{\|}{C}}\right)_{p}\!\!-OR^4-O\left(\overset{\displaystyle O}{\overset{\|}{C}}-R^3-O\right)_{q}\!\!-H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$-\!\!\left(R^5-O\right)_{x}R^5$$

R^5 is the same as R^3;

x is 1 to 10;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$.

28. The elastomer of Claim 25 wherein the charge-control agent is poly (oxy (1-oxo-1,6-hexanediyl)),alpha, alpha' oxydi-

2,1-ethanediyl) bis(w-hydroxy-5-sulfo-1,3-benzenedicarboxylate (2:1), ion (1-) methyltriphenylphosphonium.

29. The elastomer of Claim 27 wherein x is from 2 to 7.

30. The elastomer of Claim 27 wherein the charge-control agent is present in an amount of less than 1 weight percent based on total weight of the elastomer.

31. The elastomer of Claim 27 wherein the charge-control agent is present in an amount of from 0.4 to 0.7 weight percent based on total weight of the elastomer.

32. The elastomer of Claim 25 having a resistivity of less than $6X10^9$ ohm-cm.

33. A shaped article comprising the elastomer of Claim 25.

47. A polyurethane elastomer comprising:

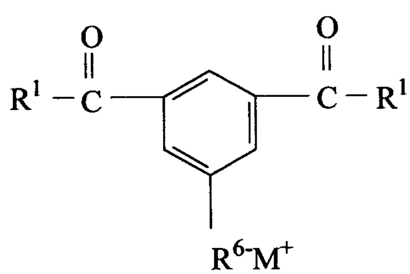
a polyisocyanate prepolymer formed by reacting an isocyanate with a polyether polyol, said polyisocyanate prepolymer being present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition;

a polyether polyol prepolymer present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition; and

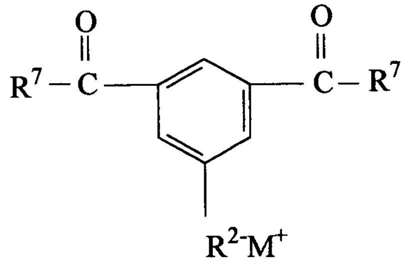
a hardener mixture comprising at least one additional polyol and at least one polyol charge-control agent, the hardener mixture being present in an amount of from 1 to 25 weight percent of the total elastomer composition,

the amounts of the polyisocyanate prepolymer, the polyether polyol prepolymer, and the hardener mixture being selected such that the equivalent ratio of hydroxyl functionality to isocyanate functionality is from 1.00 to 1.04, and the charge-control agent is present in an amount of less than 1 weight percent based on total weight of the elastomer, the polyol charge-control agent being selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$\left[O \left(CH_2 \right)_5 \overset{\overset{\large O}{\|}}{C} \right]_m OCH_2CH_2OCH_2CH_2O \left[\overset{\overset{\large O}{\|}}{C} \left(CH_2 \right)_5 O \right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$\left(O - R^3 - \overset{\overset{\large O}{\|}}{C} \right)_p OR^4 - O \left(\overset{\overset{\large O}{\|}}{C} - R^3 - O \right)_q H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$\left(R^5 - O \right)_x R^5$$

R^5 is the same as R^3;

x is from 2 to 7;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q in are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$.

No.10113.A04
PAT00018.A04

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Paul S. GLOYER et al.

Appl. No. : 09/802,760

Filed : March 8, 2001

Examiner Rachel F. Gorr
Technology Center 1700
Group Art Unit 1711
Confirmation No. 8217

For : POLYURETHANE ELASTOMERS AND SHAPED ARTICLES PREPARED THEREFROM

APPEAL BRIEF UNDER 37 C.F.R. § 1.192(a)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is from the Examiner's final rejection of claims 1, 3-10, 25-33, and 47, as set forth in her April 18, 2003 Office Action.

A. REAL PARTY IN INTEREST

The real parties in interest for the invention are Heidelberg Digital L.L.C., a Delaware limited liability company, NexPress Solutions LLC, a New York limited liability company, and Eastman Kodak Company, a New Jersey corporation.

B. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative, and the Assignees are not aware of any other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

C. STATUS OF CLAIMS

Claims 1-48 have been presented in this application. Of these, claim 2 has been cancelled, thereby leaving claims 1 and 3-48 as the pending claims.

As to the claims that are pending, claims 11-24, 34-46, and 48 are nonelected and withdrawn from consideration. Of these, claims 15, 38, and 48 are independent.

Accordingly, the claims that are pending and elected are claims 1, 3-10, 25-33, and 47. Of these, claims 1, 25, and 47 are independent.

All of pending and elected claims 1, 3-10, 25-33, and 47 stand finally rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,286,570 (SCHLUETER, JR. et al.) in view of U.S. Patent No. 4,729,925 (CHEN et al.) and European Patent Application No. 0 604 334 (RAMOS et al.). These pending and elected claims also are all on appeal, and are all reproduced in an Appendix attached to the end of this Appeal Brief.

D. STATUS OF AMENDMENTS

No amendment has been filed subsequent to the final rejection.

E. SUMMARY OF THE INVENTION

The invention pertains to a polyurethane elastomer comprising the reaction product of a polyisocyanate prepolymer, a polyether polyol prepolymer, and a hardener mixture. The polyisocyanate prepolymer is formed by reacting an isocyanate with a polyol, and the hardener mixture includes at least one additional polyol and also at least one charge-control agent. (Specification: page 4, lines 20-24, line 28, line 31, and line 32; page 5, lines 9-13, line 17, line 20, and line 21; page 9, lines 13-16, lines 18-20, and line 22)

The polyisocyanate prepolymer is present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition (Specification: page 4, lines 24-26; page 5, lines 13-15; page 9, lines 16 and 17). The polyether polyol prepolymer is present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition (Specification: page 4, lines 28 and 29; page 5, lines 17 and 18; page 9, lines 18 and 19). The hardener mixture is present in an amount of from 1 to 25 weight percent of the total elastomer composition (Specification: page 4, lines 32 and 33; page 5, lines 24 and 25; page 9, lines 22-24).

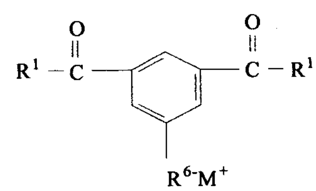
The at least one charge-control agent can be capable of being copolymerized with the polyisocyanate prepolymer, the

polyether polyol prepolymer, and the hardener mixture (Specification: page 5, lines 20-23; page 12, line 35 through page 13, line 6), and the at least one charge-control agent can be a polyol (Specification: page 11, lines 21-35). Particularly, the charge-control agent can be a polyol comprising an ionic functional group (Specification: page 8, line 32 through page 9, line 11).

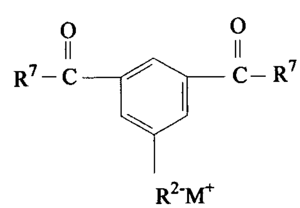
Further, the at least one charge-control agent can be both a polyol and also capable of being copolymerized with the polyisocyanate prepolymer, the polyether polyol prepolymer, and the hardener mixture (Specification: page 5, lines 33-35).

Yet additionally, the charge-control agent can be a polyol charge-control agent selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$\left[O \left(CH_2 \right)_5 \overset{\overset{O}{\|}}{C} \right]_m OCH_2CH_2OCH_2CH_2O \left[\overset{\overset{O}{\|}}{C} \left(CH_2 \right)_5 O \right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$\left(O - R^3 - \overset{\overset{O}{\|}}{C} \right)_p OR^4 - O \left(\overset{\overset{O}{\|}}{C} - R^3 - O \right)_q H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$\left(R^5 - O \right)_x R^5$$

R^5 is the same as R^3;

x is 1 to 10, or 2 to 7;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$. (Specification: page 5, line 33 through page 7, line 28; page 13, line 9 through page 14, line 31)

A particular polyol that is suitable as a charge-control agent is poly(oxy(1-oxo-1,6-hexanediyl)), alpha, alpha' oxydi-2,1-ethanediyl)bis(w-hydroxy-5-sulfo-1,3-benzenedicarboxylate (2:1), ion(1-)methyltriphenylphosphonium (Specification: page 16, lines 15-18).

Preferably, charge control agent is present in an amount of less than 2 weight percent, or less than 1 weight percent, or from 0.1 to 0.9 weight percent, or from 0.4 to 0.7 weight percent, based on the total weight of the elastomer (Specification: page 5, lines 29-31; page 10, lines 5-10; page 17, lines 8-16).

The amounts of the polyisocyanate prepolymer, the polyether polyol, and hardener mixture are selected such that the equivalent ratio of hydroxyl functionality to isocyanate

functionality is from 0.96 to 1.04, or from 1.00 to 1.04 (Specification: page 5, lines 27-29; page 18, lines 10-17).

The invention further pertains to a shaped article comprising the polyurethane elastomer as indicated. And the polyurethane elastomer of the invention can have a resistivity of less than 6 X 10^9 ohm-cm. (Specification: page 8, lines 14-19; page 20, lines 5-12)

F. ISSUE

Whether claims 1, 3-10, 25-33, and 47 are unpatentable under 35 U.S.C. § 103(a) over U.S. Patent No. 5,286,570 (SCHLUETER, JR. et al.) in view of U.S. Patent No. 4,729,925 (CHEN et al.) and European Patent Application No. 0 604 334 (RAMOS et al.)

G. GROUPING OF CLAIMS

Claims 1, 3-10, 25-33, and 47 are considered to stand or fall together, but only for the purpose of the rejection on appeal.

H. ARGUMENT

The Examiner concludes that it would have been obvious, in the SCHLUETER, JR. et al. polyurethane elastomer, to replace the SCHLUETER, JR. et al. charge-control agents with the CHEN et al. and RAMOS et al. charge-control agents, to prevent agent from leaching out (April 18, 2003 final Office Action, paragraph 7). The Examiner's sole justification for this conclusion is her unsupported statement that CHEN et al. and RAMOS et al. teach a "better" way for incorporating charge-control agents (April 18, 2003 final Office Action, paragraph 8). Not only does the Examiner fail to present any evidence substantiating the alleged superiority, but this is not the correct standard for combining teachings. Rather, the proper criterion is motivation; and the Examiner fails to show the

necessary motivation for combining the teachings of CHEN et al. and RAMOS et al. with those of SCHLUETER, JR. et al.

The Examiner inaccurately truncates Appellants' arguments, in stating Appellants' position to be that "one wouldn't use the charge control agents of CHEN and RAMOS in SCHLUETER's polyurethane because the charge control agents of SCHLUETER are different" (April 18, 2003 final Office Action, paragraph 8). In fact, Appellants maintain, correctly, that SCHLUETER, JR. et al. on the one hand, and CHEN et al. and RAMOS et al. on the other, address the problem of charge-control agent depletion by means of different and unrelated mechanisms, and using different and unrelated agents.

As to different and unrelated mechanisms, SCHLUETER, JR. et al. teaches a mobile charge-control agent, with agent movement through the polyurethane elastomer being reduced by the configurations both of the agent itself and of the elastomer; in contrast, CHEN et al. and RAMOS et al. teach agent retention by actual attachment to the elastomer. As to different and unrelated agents, the SCHLUETER, JR. et al. charge-control agents are asymmetric aliphatic sulfates, in contrast to the aromatic polyols of CHEN et al. and RAMOS et al.

So not only does the Examiner fail to meet her burden of showing the requisite motivation, but in fact the above-noted different and unrelated mechanisms and agents establish that motivation must of necessity be lacking. By itself, this absence of motivation requires the conclusion that SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. do not establish *prima facie* obviousness.

Moreover, the Examiner's proposed modification would change the SCHLUETER, JR. et al. principle of operation. For this additional reason, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. do not establish *prima facie* obviousness.

Yet further, SCHLUETER, JR. et al. even teaches away from the particular modification argued by the Examiner - i.e., substituting in the copolymerizable charge-control agents of CHEN et al. and RAMOS et al. The SCHLUETER, JR. et al. requires its polyurethane elastomer to include triol crosslinker, for the purpose of providing the polymer crosslinking network that reduces charge-control agent mobility. This requirement is inconsistent with using the CHEN et al. and RAMOS et al. agents, which instead are retained by attachment. So for this still additional reason, the claims on appeal are patentable over the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

And still additionally, SCHLUETER, JR. et al. and CHEN et al. and RAMOS et al., as cited by the Examiner, fail to teach or suggest Appellants' 45 to 70 weight percent of polyisocyanate prepolymer, as recited in all of the claims on appeal. The Examiner mistakenly cites Example II of SCHLUETER, JR. et al. as disclosing 50 weight percent polyisocyanate prepolymer (April 18, 2003 final Office Action, paragraph 4). However, the proportion, of the SCHLUETER, JR. et al. Example II polyisocyanate prepolymer, actually cannot be more than 18.78 weight percent. And the significance, of the difference between this 18.78 weight percent of SCHLUETER, JR. et al. Example II polyisocyanate prepolymer, and Appellants' recited 45 weight percent lower limit of polyisocyanate prepolymer, is demonstrated in the art. Accordingly, for this still additional reason, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. do not establish *prima facie* obviousness.

1. There is no motivation for combining the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

All three of the references presently cited by the Examiner against the claims - SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. - indeed do disclose polyurethane elastomers provided with charge-control agents, for the purpose of stabilizing elastomeric

resistivity (SCHLUETER, JR. et al., column 1, lines 47-50; CHEN et al., column 1, lines 45-59; RAMOS et al., page 3, lines 19 and 20).

Moreover, each of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. address the problem of charge-control agent being lost from the elastomer (SCHLUETER, JR. et al., column 1, line 64 through column 2, line 11; CHEN et al., column 1, lines 45-59; RAMOS et al., page 1, line 19 through page 2, line 3).

Yet additionally, SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. all teach means of inhibiting charge-control agent depletion.

However, SCHLUETER, JR. et al. on the one hand, and CHEN et al., and RAMOS et al. on the other, deal with this problem by means of different, and in fact unrelated, mechanisms. Further, they do so using different and unrelated agents.

As to the different and unrelated mechanisms, SCHLUETER, JR. et al. employs a very asymmetric charge-control agent that remains unattached in the polyurethane elastomer, with this elastomer itself being highly crosslinked. Mobility and diffusion of the charge-control agent, through the polymeric network, is reduced by both the asymmetry of the agent and the high degree of polymeric crosslinking (column 2, line 65 through column 3, line 1; column 4, lines 36-40).

In contrast, CHEN et al. and RAMOS et al. actually attach the charge control agent to the elastomer - specifically, by copolymerizing the charge control agent with the other reactants in the making of the polyurethane (CHEN et al., column 2, lines 25-32; RAMOS et al., page 3, lines 31 and 32, and page 4, line 1). Contrary to SCHLUETER, JR. et al., CHEN et al. and RAMOS et al. do not teach or suggest the use of elastomer crosslinking and charge control agent asymmetry for inhibiting agent depletion.

As to the different and unrelated charge-control agents, the SCHLUETER, JR. et al. charge-control agents are asymmetric, ionic aliphatic quaternary ammonium sulfate salts, characterized by the formula as set forth in SCHLUETER, JR. et al. at column 2, lines 55-65 and column 7, lines 25-40. In contrast, the charge-control agents of CHEN et al. and RAMOS et al. are aromatic polyols of particular formulae (CHEN et al., column 1, line 65 through column 3; RAMOS et al., page 3, lines 31-58; page 4, lines 29 and 30). The dissimilarity and unrelatedness of the agents is readily apparent from comparison of the indicated formulae.

Accordingly, SCHLUETER, JR. et al. indeed does employ completely different and unrelated means, from those of CHEN et al. and RAMOS et al., to effect charge control agent retention, and completely different and unrelated charge control agents for

accomplishing this result. Therefore, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. provide no motivation for using the charge control agents of CHEN et al. and RAMOS et al. in the SCHLUETER, JR. et al. polyurethane elastomer.

And regarding RAMOS in particular, as compared with SCHLUETER, JR. et al. and CHEN et al., the RAMOS et al. patent publication discloses a polyurethane elastomer copolymerized with charge control agent, having a shore A hardness of from about 15 to about 40, and employed with particle transfer rollers used to clean moving webs (page 3, lines 1-2; page 4, lines 4-8 and lines 29-30). RAMOS et al. teaches that the CHEN et al. transfer roller is unacceptable for use as a particle transfer roller, because it has too high a durometer - in the range of 40-90 Shore A (page 3, lines 19-25).

And CHEN et al. indeed does teach a hardness of about 40-90 Shore A (column 9, lines 36-39), while SCHLUETER, JR. et al. correspondingly discloses a Shore A harness range of from 60 to about 95 (column 4, lines 55-61; column 5, lines 15-20). But in any event, nothing in RAMOS et al. supplies the deficiencies of the references, as have been noted in detail.

With respect to these deficiencies, the Examiner's only basis, for finding the combination of SCHLUETER, JR. et al., CHEN

et al., and RAMOS et al. to have been obvious, is her conclusion that CHEN et al. and RAMOS et al. teach a "better" way for incorporating charge-control agents (April 18, 2003 final Office Action, paragraph 8). The Examiner presents no evidence for this position, and in fact her conclusion requires assumptions that are without support in the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

For instance, nothing in SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. supports any argument that the attachment means of CHEN et al. and RAMOS et al. are superior to obstructing movement of a mobile agent by asymmetry and crosslinking, as taught by SCHLUETER, JR. et al. Nor are there grounds for concluding that the attached polyols of CHEN et al. and RAMOS et al. give "better" results than the SCHLUETER, JR. et al. obstructed ammonium salts.

And notwithstanding the foregoing, the Examiner does not apply the proper standard for determining obviousness. The correct issue to be addressed is whether there is motivation for combining the SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. teachings. The Examiner does not cite any, and in fact there is none. This absence of motivation by itself supports the conclusion that the claims are allowable over the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

2. **The Examiner's proposed modification would change the SCHLUETER, JR. et al. principle of operation**

It is further noted that as a matter of law, if the proposed modification would change the principle of operation that is taught in the reference being modified, then the teachings of the references are not sufficient to have rendered the claimed invention *prima facie* obvious. In re Ratti, 123 U.S.P.Q. 349 (CCPA 1959); M.P.E.P. §2143.01. And in fact, combating charge-control agent depletion by attachment of the agent, as taught in CHEN et al. and RAMOS et al., indeed would change the SCHLUETER, JR. et al. means of retaining agent by asymmetry and crosslinking.

Therefore, teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. are not sufficient to have rendered the claimed invention *prima facie* obvious. So for this additional reason, the claims are allowable over the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

3. **SCHLUETER, JR. et al. teaches away from CHEN et al. and RAMOS et al.**

And not only would combining the teachings of SCHLUETER, JR. et al., and RAMOS et al. not have been obvious, but SCHLUETER, JR. et al. actually teaches away from the very modification to SCHLUETER, JR. et al. that is argued by the Examiner - i.e., replacing the SCHLUETER, JR. et al. charge control agent with

those of CHEN et al., and RAMOS et al. In this regard, it is yet further noted, also as a matter of law, that combining references which teach away from their combination is improper. In re Grasselli, 218 U.S.P.Q. 769 (Fed. Cir. 1983); M.P.E.P. §2145, paragraph X.D.2.

As to this principle, SCHLUETER, JR. et al. requires, for the elastomer taught therein, a sufficient amount of bifunctional chain extenders and trifunctional crosslinking agents to provide a crosslinked elastomer, and the trifunctional crosslinking agents must comprise 10% to 40% by weight of the extenders and crosslinkers (column 3, lines 10-20; column 3, lines 35-42; column 6, lines 33-38). The trifunctional agents are needed for contributing the crosslink exchange sites that provide the three-dimensional network (column 7, lines 5-10); it is this network that acts, in conjunction with the agent asymmetry, to combat depletion.

Requiring this network, to inhibit the passage of mobile charge-control agent, is inconsistent with using charge-control agents that are instead retained by attachment, as taught by CHEN et al. and RAMOS et al. SCHLUETER, JR. et al. therefore indeed does teach away from the Examiner's proposed combination with CHEN et al. and RAMOS et al.; so for this still

further reason, the claims are allowable over the combination of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

4. SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. fail to teach or suggest all of Appellants' recited limitations

On of the requirements for establishing a *prima* facie case of obviousness is that the art must teach or suggest all the claim limitations. Each of Appellants' claims on appeal recites 45 to 70 weight percent polyisocyanate prepolymer. The Examiner addresses this recitation by citing Example II of SCHLUETER, JR. et al. as teaching "50 wt % prepolymer" (April 18, 2003 final Office Action, paragraph 4). However, even if Example II of SCHLUETER, JR. et al. is read most favorably for the purposes of the Examiner, it cannot be teaching more than 18.78 weight percent of polyisocyanate prepolymer.

It is presumed that the Examiner's error is caused by the assumption that all of Mix A, in Example II of SCHLUETER, JR. et al., polymerizes to form polyisocyanate prepolymer. In fact, the starting materials of this Mix A - these materials being combined to form Mix A before Mix A is added to other materials - consist of polytetramethylene ether glycol (PTMEG) and 4,4'-diphenyl methane diisocyanante (MDI) (SCHLUETER, JR. et al., column 10, line 65 through column 11, line 9); further, PTMEG

and MDI indeed are polymerizable to polyisocyanate prepolymer, by means of the reaction of PTMEG hydroxyl functionality with MDI isocyanate functionality to provide the urethane group.

The Mix B starting materials in Example II of SCHLUETER, JR. et al. - these materials correspondingly being combined to form Mix B before Mix B is added to other materials - consist of butanediol (BDO), the Cyastat LS charge-control agent, and more PTMEG (SCHLUETER, JR. et al., column 11, lines 10-16).

The polyurethane polymer of SCHLUETER, JR. et al. Example II is prepared from a composition that includes, *inter alia*, 30.6 parts of Mix A and 30 parts of Mix B (SCHLUETER, JR. et al., column 11, lines 19-29). Of this composition, it is the Mix A and Mix B materials that polymerize to form the polyurethane; the other materials in this composition are solvent and surfactant.

The 30.6 parts of Mix A and 30 parts of Mix B add up to 60.6 parts. 30.6 parts of Mix A is about 50 weight percent of this 60.6 parts total. It is presumed that the Examiner made this calculation, and based her conclusion of "50 wt % prepolymer" on the assumption that before its addition to the composition including Mix B, all of Mix A had polymerized to provide polyisocyanate prepolymer.

However, because of the large excess of isocyanate to hydroxyl in Mix A, it is impossible for all of Mix A to have undergone this prepolymerization. Even assuming a result most favorable to the Examiner's position, the prepolymerization must of necessity have left unreacted MDI; the most polyisocyanate prepolymer that Mix A could have provided, for reaction with Mix B, would have been an amount of polyisocyanate prepolymer sufficient to provide 18.78 weight percent prepolymer.

In this regard, the PTMEG of SCHLUETER, JR. et al. Example II is Terathane 650 (SCHLUETER, JR. et al., column 10, line 68 through column 11, line 1), which is characterized by a molecular weight of 650 and 2 hydroxyl equivalents per mole. MDI has a molecular weight of 251 and 2 isocyanate equivalents per mole.

Mix A consists of 92.3 parts MDI added to 16.5 parts PTMEG (SCHLUETER, JR. et al., column 11, lines 5-7), totaling 108.8 parts. The PTMEG and MDI therefore provide 0.01428 hydroxyl equivalents and 0.20685 isocyananate equivalents, respectively.

Accordingly, the PTMEG is the limiting reactant. The prepolymerzation most favorable to the Examiner's position would provide reaction of the maximum amount of MDI, so as to incorporate as high a proportion as possible of the reactants into prepolymer. This would involve the formation of triblocks

exclusively - nothing but oligomers, each characterized by a PTMEG endcapped by two MDI monomers, with neither of these two reacted MDI monomers reacted with any other PTMEG.

Of course, such an idealized result for the Examiner - i.e., a product of pure MDI-PTMEG-MDI triblock prepolymer - would not be expected to occur. But even if it did, the resulting proportion of polyisocyanate prepolymer indeed could only reach 18.78 weight percent, as demonstrated by the following calculations.

<u>Equivalents of Polyisocyanate Prepolymer Reactants Consumed (Max.)</u>

Equivalents PTMEG Polymerized (Max.)__________0.01428

Equivalents MDI Polymerized (Max.)___2 x 0.01428 = 0.02856

<u>Wt. of Polyisocyanate Prepolymer Formed (Max.)</u>

Wt. PTMEG Reacted (Max.)__0.01428 OH equiv./2 equiv. per mole x 650 g. per mole = 4.64 g

Wt. MDI Reacted (Max.)____0.02856 CNO equiv./2 equiv. per mole x 251 g. per mole = 35.84 g

Total Wt. Reactants Consumed_______4.64 g + 35.84 g = 40.48 g

<u>Wt. % of Polyisocyanate Prepolymer in Mix A (Max.)</u>

Max. Wt. Polyisocyanate Prepolymer/Total Wt. Mix A x 100%
= 40.48 g/108.8 g x 100%
= 37.2 wt.%

<u>Wt. % of Isocyanate Prepolymer in Polyurethane Product (Max.)</u>

30.6 parts Mix A x 37.2 wt.% Polyisocyanate Prepolymer/60.6 parts Polyurethane Product

= 18.78 wt.%

Even this 18.78 weight percent idealized result, for the SCHLUETER, JR. et al. Example II polyisocyanate prepolymer, is significantly less than the 45 weight percent lower limit of Appellants' recited range. And to the extent that, in actual practice, the polyisocyanate prepolymer of SCHLUETER, JR. et al. Example II were to deviate from this 18.78 weight percent hypothetical yield of pure triblock prepolymer - which of course it must do - then the weight percent of polyisocyanate prepolymer obtained would be that much less, and so differ from Appellants' 45 weight percent lower limit to an even greater extent.

And in fact, the Examiner would not be permitted to rely on the foregoing 18.78 weight percent idealized maximum for the SCHLUETER, JR. et al. Example II polyisocyanate prepolymer. Where the Examiner cites a reference as providing a teaching, the burden is on her to demonstrate that this teaching actually is to be found in the reference. The Examiner has failed to

show that SCHLUETER, JR. et al. Example II teaches 18.78 weight percent, or any other quantifiable amount, of polyisocyanate prepolymer. So the Examiner would not be entitled to assert any numerical value, for the polyisocyanate prepolymer of SCHLUETER, JR. et al. Example II, in trying to argue that SCHLUETER, JR. et al. teaches or suggests Appellants' recited polyisocyanate prepolymer 45 to 70 weight percent range.

Yet further, the significance of the difference - between even the idealized 18.78 maximum weight percent polyisocyanate prepolymer of SCHLUETER, JR. et al. Example II, and Appellants' recited 45 weight percent lower limit for polyisocyanate prepolymer - is conclusively demonstrated by the art. For instance, the superiority of Appellants' higher proportion of polyisocyanate prepolymer is addressed by the SCHLUETER, JR. et al. reference itself.

In this regard, at column 8, lines 15-35, SCHLUETER, JR. et al. states that the polyurethane elastomer final product may be made without first preparing a prepolymer, by reacting all the starting materials - including those that would otherwise have been used for forming the prepolymer - together at once. However, SCHLUETER, JR. et al. further states here that proceeding in this manner results in a more random polyurethane product, because multiple types of reactions are occurring

simultaneously; instead, initially preparing the prepolymer allows for greater control of the reaction, and correspondingly a more predictable result.

Accordingly, the higher the proportion of the polymer final product that is provided by polyisocyanate prepolymer, the more control can asserted in the polymerization process, to obtain the desired polyurethane product. So Appellants' recited 45 to 70 weight percent of polyisocyanate prepolymer, comprising a greater proportion of the polyurethane than is taught in Example II of SCHLUETER, JR. et al., correspondingly allows for greater control of polymerization, and also a more predictable polyurethane structure, than would be produced by SCHLUETER, JR. et al. Example II.

Example II of SCHLUETER, JR. et al. therefore does not teach or suggest Appellants' recited 45 to 70 weight percent of polyisocyanate prepolymer. Accordingly, with respect to each of Appellants' claims on appeal, SCHLUETER, JR. et al., CHEN at al., and RAMOS et all, as applied by the Examiner, fail to disclose or suggest all the recited limitations.

Therefore, also for this reason, the teachings of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al. are not sufficient to have rendered the claimed invention *prima facie* obvious. So for this additional reason, the claims are allowable over the

combination of SCHLUETER, JR. et al., CHEN et al., and RAMOS et al.

I. CONCLUSION

For the reasons advanced above, Appellants submit that the rejection should be reversed.

This Appeal Brief is being submitted in triplicate, pursuant to 37 C.F.R. §1.192(a).

Also being submitted is a transmittal, authorizing payment in the amount of $440.00. Of this $440.00 total, $330.00 is the fee set forth in 37 CFR §1.17(b), for filing a brief in support of an appeal, and $110.00 is the fee set forth in 37 CFR §1.17(a)(1), for a one month extension of time for filing the brief. No additional fees are believed to be due at this time. However, the Commissioner is authorized to charge any additional fee, or to credit any overpayment, to Deposit Account No. 50-1381.

Respectfully submitted,
Paul S. GLOYER et al.

Roger P. Glass
Reg. No. 30,841

October 17, 2003
Roger P. Glass, Esq.
5597 Seminary Road, No. 1301S.
Falls Church, VA 22041
(703) 379-8443

APPENDIX

CLAIMS ON APPEAL:

1. A polyurethane elastomer comprising the reaction product of:

a polyisocyanate prepolymer formed by reacting an isocyanate with a polyol, said polyisocyanate prepolymer being present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition;

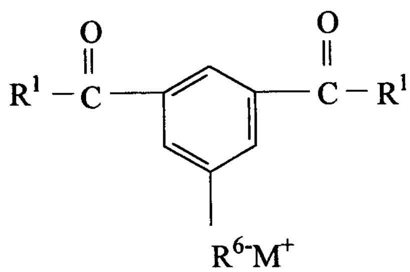
a polyether polyol prepolymer present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition; and

a hardener mixture comprising at least one additional polyol and at least one charge-control agent, the at least one charge control agent being a polyol capable of being copolymerized with the polyisocyanate prepolymer, the polyether polyol, and the hardener mixture, the hardener mixture being present in an amount of from 1 to 25 weight percent of the total elastomer composition,

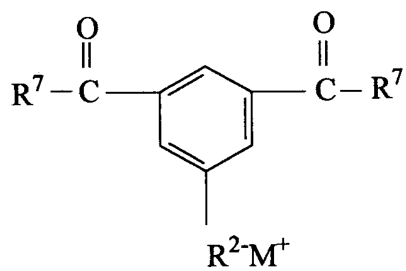
the amounts of the polyisocyanate prepolymer, the polyether polyol, and hardener mixture being selected such that the equivalent ratio of hydroxyl functionality to isocyanate functionality is from 0.96 to 1.04.

3. The elastomer of Claim 1 wherein the charge-control agent is a polyol charge-control agent selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$\left[O \left(CH_2 \right)_5 \overset{\overset{\displaystyle O}{\|}}{C} \right]_m OCH_2CH_2OCH_2CH_2O \left[\overset{\overset{\displaystyle O}{\|}}{C} \left(CH_2 \right)_5 O \right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$-\!\!\left(O-R^3-\overset{\overset{\displaystyle O}{\|}}{C}\right)_{\!p}\!\!-OR^4-O\!\left(\overset{\overset{\displaystyle O}{\|}}{C}-R^3-O\right)_{\!q}\!\!-H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$-\!\left(R^5-O\right)_{x}R^5$$

R^5 is the same as R^3;

x is 1 to 10;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$.

4. (Amended) The elastomer of Claim 1 wherein the charge-control agent is poly(oxy(1-oxo-1,6-hexanediyl)), alpha, alpha' oxydi-2,1-ethanediyl) bis(w-hydroxy-5-sulfo-1,3-benzenedicarboxylate(2:1),ion(1-)methyltriphenylphosphonium.

5. The elastomer of Claim 3 wherein x is from 2 to 7.

6. The elastomer of Claim 3 wherein the charge-control agent is present in an amount of less than 2 weight percent based on total weight of the elastomer.

7. The elastomer of Claim 3 wherein the charge-control agent is present in an amount of less than 1 weight percent based on total weight of the elastomer.

8. The elastomer of Claim 3 wherein the charge-control agent is present in an amount of from 0.4 to 0.7 weight percent based on total weight of the elastomer.

9. The elastomer of Claim 1 having a resistivity of less than $6X10^9$ ohm-cm.

10. A shaped article comprising the elastomer of Claim 1.

25. A polyurethane elastomer comprising the reaction product of:

a polyisocyanate prepolymer formed by reacting an isocyanate with a polyol, said polyisocyanate prepolymer

being present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition;

a polyether polyol prepolymer present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition; and

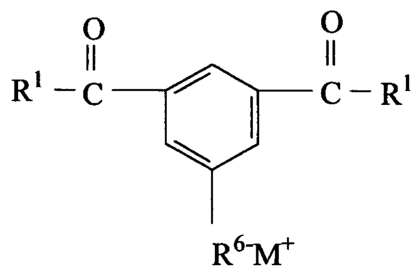
a hardener mixture comprising at least one additional polyol and at least one charge-control agent capable of being copolymerized with the polyisocyanate prepolymer, the polyether polyol prepolymer, and the hardener mixture such that the charge-control agent is covalently bonded to the polyurethane elastomer, the hardener mixture being present in an amount of from 1 to 25 weight percent of the total elastomer composition,

the amounts of the polyisocyanate prepolymer, the polyether polyol prepolymer, and hardener mixture being selected such that the equivalent ratio of hydroxyl functionality to isocyanate functionality is from 0.96 to 1.04, and the charge-control agent is present in an amount of less than 2 weight percent based on total weight of the elastomer.

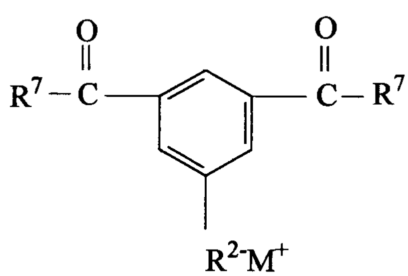
26. The elastomer of Claim 25 wherein the charge-control agent is a polyol comprising an ionic functional group.

27. The elastomer of Claim 25 wherein the charge-control agent is a polyol charge-control agent selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$-\!\!\left[O\left(CH_2\right)_5\overset{\displaystyle O}{\overset{\|}{C}}\right]_m OCH_2CH_2OCH_2CH_2O-\!\!\left[\overset{\displaystyle O}{\overset{\|}{C}}\left(CH_2\right)_5O\right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$-\!\left(O-R^3-\overset{\overset{\displaystyle O}{\|}}{C}\right)_{p}\!-OR^4-O\left(\overset{\overset{\displaystyle O}{\|}}{C}-R^3-O\right)_{q}\!-H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$-\!\left(R^5-O\right)_{x}R^5$$

R^5 is the same as R^3;

x is 1 to 10;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$.

28. The elastomer of Claim 25 wherein the charge-control agent is poly (oxy (1-oxo-1,6-hexanediyl)),alpha, alpha' oxydi-

2,1-ethanediyl) bis(w-hydroxy-5-sulfo-1,3-benzenedicarboxylate (2:1), ion (1-) methyltriphenylphosphonium.

29. The elastomer of Claim 27 wherein x is from 2 to 7.

30. The elastomer of Claim 27 wherein the charge-control agent is present in an amount of less than 1 weight percent based on total weight of the elastomer.

31. The elastomer of Claim 27 wherein the charge-control agent is present in an amount of from 0.4 to 0.7 weight percent based on total weight of the elastomer.

32. The elastomer of Claim 25 having a resistivity of less than $6X10^9$ ohm-cm.

33. A shaped article comprising the elastomer of Claim 25.

47. A polyurethane elastomer comprising:

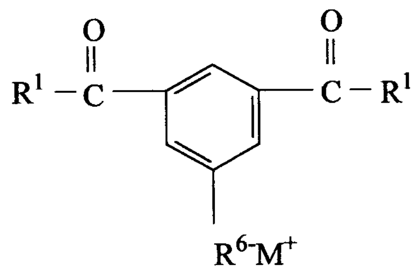
a polyisocyanate prepolymer formed by reacting an isocyanate with a polyether polyol, said polyisocyanate prepolymer being present in an amount of from 45 to 70 weight percent based on total weight of the elastomer composition;

a polyether polyol prepolymer present in an amount of from 25 to 50 weight percent based on total weight of the elastomer composition; and

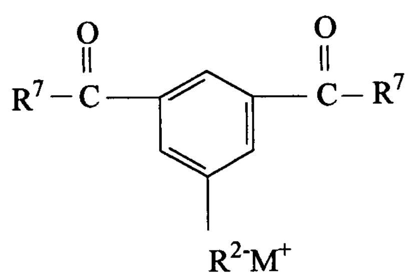
a hardener mixture comprising at least one additional polyol and at least one polyol charge-control agent, the hardener mixture being present in an amount of from 1 to 25 weight percent of the total elastomer composition,

the amounts of the polyisocyanate prepolymer, the polyether polyol prepolymer, and the hardener mixture being selected such that the equivalent ratio of hydroxyl functionality to isocyanate functionality is from 1.00 to 1.04, and the charge-control agent is present in an amount of less than 1 weight percent based on total weight of the elastomer, the polyol charge-control agent being selected from at least one of formula (I) or formula (II):

(I)



(II)



wherein R^1 represents:

$$\left[O \left(CH_2 \right)_5 \overset{\displaystyle O}{\overset{\|}{C}} \right]_m OCH_2CH_2OCH_2CH_2O \left[\overset{\displaystyle O}{\overset{\|}{C}} \left(CH_2 \right)_5 O \right]_n H;$$

R^6 represents sulfonate, oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^2 represents oxyphenylene sulfonate, oxycyclohexylene sulfonate, or p-toluenesulfonamidosulfonyl;

R^7 represents:

$$\left(O - R^3 - \overset{\displaystyle O}{\overset{\|}{C}} \right)_p OR^4 - O \left(\overset{\displaystyle O}{\overset{\|}{C}} - R^3 - O \right)_q H;$$

R^3 represents a straight or branched chain alkylene group having 2 to 7 carbon atoms;

R^4 is the same as R^3 or is

$$\left(R^5 - O \right)_x R^5$$

R^5 is the same as R^3;

x is from 2 to 7;

m and n are integers which together are of sufficient value to achieve an R^1 weight average molecular weight of 300 to 30,000;

p and q in are integers which together are of sufficient value to achieve an R^7 weight average molecular weight of 300 to 30,000; and

M represents hydrogen, an alkali metal, ammonium, or $P^+(C_6H_5)_3CH_3$.